EFFECT OF THE INVENTION

[Effect of the Invention]In the polymer electrolyte fuel cell concerning this invention, the effect which keeps humidity constant also to the humidity in a high humidity state was seen by using the absorption-and-desorption-of-moisture agent which has porous structure. When an absorption-and-desorption-of-moisture agent was held by a porous body, the generation efficiency of the polymer electrolyte fuel cell was raised rather than the time of not being held. A conditioning agent also plays the role of a dispersion layer within a polymer electrolyte fuel cell, and distributes the liquid fuel or gaseous fuel of a cell inside a polymer electrolyte fuel cell efficiently.

[Translation done.]

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PRIOR ART

[Description of the Prior Art]A fuel cell is a cell which equips with an electrode the both sides of the electrolyte which is an ion conductor, supplies oxidizing gas, such as oxygen and air, to one electrode, supplies liquid fuel, such as gaseous fuel, such as hydrogen and hydrocarbon, or alcohol, to the electrode of another side, makes electrochemical reaction cause, and is made to generate the electrical and electric equipment and water.
[0003]There are various sorts in a fuel cell according to an electrolytic kind, for example, there are an alkaline aqueous solution type, an acid aqueous solution type, a melting carbonate type, a solid oxide type, and a solid polymer type. Among those, the polymer electrolyte fuel cell (PEFC) which uses solid polymer type proton conductivity polymers as an electrolyte is a system which uses high-purity-hydrogen gas as fuel.
[0004]It is possible to make it operate also at a low temperature, and since especially PEFC has high power density also in a low operating-temperature field, its a possibility of being put in practical use by the power generation for cars and the power generation for small-scale residences is high. The direct type methanol fuel cell (DMFC) especially which carries out direct supply of the methanol as fuel, Since a solid polymer electrolyte can be used as an electrolyte, it may be operated below 100 **, it is thought that it fits small size and portability with the fluid since transportation and storage are easy for fuel, and it is seen as a hopeful as the future source of power for cars, and a power supply for mobile electronic equipment.
[0005]The direct type methanol fuel cell (PEM-DMFC) which uses solid polyelectrolyte membrane is a fluorine system poly membrane with a sulfonic group, For example, it has the structure which faced across thin film both sides, such as the Nafion (Nafion) film made from Du Pont, with the porous electrode which the catalyst was made to support, direct supply of the methanol aqueous solution is carried out to a negative electrode, and oxygen or air is supplied to an anode. Here, since an ion conduction substance was water, the solid polyelectrolyte membrane used for a polymer electrolyte fuel cell always needed to be

humidified in the fixed state, and the method was examined from the former. Since water is generated by the anode, if it does not drain, water covers the anode side catalyst and it becomes impossible on the other hand, to contact oxygen by the chemical reaction within a solid polymer type cell. Therefore, it is an important technical problem to keep suitable the humidity in a polymer electrolyte fuel cell. At present, in order to humidify solid polyelectrolyte membrane, the method of supplying the humidification fuel which carried out bubbling underwater to a negative electrode is known. Or the law which humidifies a negative electrode uniformly is provided by having a liquid tank and a water tank as shown in JP,9-16180,A, passing the current plate formed with the porous conductive material in the mixture of methanol and water, and supplying a negative electrode.

[0006]In JP,2000-173633,A (Japanese Patent Application No. 10-340653). It has between the charge collector and electrode which press the electrode which touches solid polyelectrolyte membrane in the water retaining layer of the porous layer which consists of resin mixing carbon, and the way the water supplied from a water retaining layer humidifies solid polyelectrolyte membrane through an electrode is provided.

[0007]However, between the two above-mentioned examples, by the method of humidifying JP,9-16180,A, the supply of the fuel to a fuel cell must be a flow state, piping and the tank for it are needed and the miniaturization of a fuel cell is difficult for it. On the other hand, in the method of humidifying JP,2000-173633,A, since the humidification to the charge collector by a water retaining layer was not controlled highly, there was a problem of fault humidification that the collecting efficiency falls [the charge collector itself] including water.

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TECHNICAL FIELD

[Field of the Invention]This invention relates to the polymer electrolyte fuel cell which uses a gas or a fluid as fuel. In detail, the humidity in a polymer electrolyte fuel cell is kept constant, and solid polyelectrolyte membrane is related with the polymer electrolyte fuel cell by which it is humidified moderately and in which it deals.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Therefore, the polymer electrolyte fuel cell which the humidity inside a fuel cell is kept constant, and solid polyelectrolyte membrane is humidified moderately, and does not need the further auxiliary device for gas conditioning, which is miniaturized and in which it deals was called for.
[0009]

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MEANS

[Means for Solving the Problem]According to this invention, a humidity conditioning layer which consists of absorption-and-desorption-of-moisture material in a fuel cell with which a charge collector of a couple was opposite-**(ed) by both sides of solid polyelectrolyte membrane via an electrode of a couple counters solid polyelectrolyte membrane, Or a polymer electrolyte fuel cell having via an electrode or an electrode, and a charge collector is provided.
[0010]
[Embodiment of the Invention]The polymer electrolyte fuel cell concerning this invention mainly comprises a humidity conditioning layer which consists of the charge collector and absorption-and-desorption-of-moisture material of solid polyelectrolyte membrane, the electrode of a couple, and a couple. Usually, this polymer electrolyte fuel cell may be stored by containers, such as a case and a can.
[0011]Although solid polyelectrolyte membrane in particular is not limited, for example A sulfonic group, The resin which has a phosphonic acid group, a phenol system hydroxyl group, or a fluorine-containing carbon sulfonic group as a cation exchange group, PSSA-PVA (polystyrene sulfonate polyvinyl alcohol copolymer) and the thing which consists of PSSA-EVOH (polystyrene sulfonate ethylene vinyl alcohol copolymer) etc. are mentioned. Especially, what consists of ion-exchange resin which has a fluorine-containing carbon sulfonic group is preferred, and, specifically, Nafion (a trade name, U.S. Du Pont) is used. 50 micrometers - 300 micrometers of electrolytic thickness are 50 micrometers - 100 micrometers preferably, for example.
[0012]Solid polyelectrolyte membrane fabricates the precursor of resin by publicly known methods, such as heat pressing molding, roll forming, and extrusion molding, in the shape of a film, and is obtained hydrolysis and by acid-type--ization-processing. It can also obtain from the solution which dissolved fluorine system cation exchange resin in solvents, such as alcohol, by the solvent cast method. A following electrode and catalyst bed may use the solid

polyelectrolyte membrane supported beforehand instead of an electrode, a catalyst bed, and solid polyelectrolyte membrane.

[0013]As an electrode, carbon, for example, black lead, expanded graphite, carbon black powder, etc. can be formed as a material. Specifically, carbon paper can be used.

[0014]The electrode may be arbitrarily provided with the catalyst bed. As a catalyst bed, a platinum, platinum alloy, gold, gold alloy, palladium, palladium alloy, and platinum-ruthenium etc. are mentioned. These metal can be used also as which catalyst bed of a negative electrode or an anode. To the catalyst bed of a negative electrode, a platinum-ruthenium is preferred.

[0015]What gave a water-repellent finish porous bases, such as the molding body of carbon paper and carbon, a sintered compact of carbon, a carbon fiber, a sintered metal, a foam metal, and a metal fiber aggregate, is used, and the thing of a charge collector of a carbon fiber is especially preferred.

[0016]As absorption-and-desorption-of-moisture material, a silicate, an aluminate, zirconia, manganese oxide, a hexacyano iron-oxide salt, an phosphate, silica, zeolite, etc. are mentioned. Especially, silica is preferred. Absorption-and-desorption-of-moisture material has what was prolonged in tunnel form in one dimension, and a preferred thing which has the porous structure which has the shape of fine pores like a honeycomb in three dimensions. It is available with each size and a pole diameter is 50-150A preferably. According to the composition which has this pole diameter, in a high humidity state (not less than 80% of relative humidity), the quantity to humidity which can be absorbed moisture becomes large rather than the absorption-and-desorption-of-moisture material of other pole diameters.

[0017]As a gestalt of absorption-and-desorption-of-moisture material, a meso-porous molecular sieve, a sheet, granulation, particles, etc. are mentioned. Especially, particles are preferred. It is appropriate to contain in one or more stratified sheet-shaped structures where, as for absorption-and-desorption-of-moisture material, both sides were inserted into absorption-and-desorption-of-moisture material by the porous body at the time of particle state. As for the circumference of a porous body, in the case of the structure where a humidity conditioning layer consists of absorption-and-desorption-of-moisture material sandwiched by the porous body, it is preferred to carry out ** with conductive paste. Silver paste, and silver and carbon paste are mentioned, and silver paste of conductive paste is especially preferred.

[0018]As a porous body which sandwiches absorption-and-desorption-of-moisture material, a thing like textile fabrics, a nonwoven fabric, paper making, and extension porous membrane which has a hole is used. The nonwoven fabric which consists of polypropylene, polyethylene, and carbon especially, especially the nonwoven fabric which consists of polypropylene are preferred. about 10-500 A of sizes of the hole of a porous body are about 100-300A preferably -- the number of holes -- about 10^{8} - $10^{10}/cm^{2}$ -- they are about 10^{8} / cm^{2} preferably.

Especially, the nonwoven fabric which has about 10^8 / cm^2 for an about 100-200-A hole is preferred. About 100-500 A of thickness of a porous body is about 200-300A preferably.

[0019]In order to make easy to take out the current from the negative pole electrode side, a metal ion shall be supported to a porous body, or metallic mesh, such as stainless steel and iron, shall be piled up further. Alkali metal ion, such as sodium, potassium, and lithium, can be used for a metal ion, for example.

[0020]The position which keeps constant the humidity in a polymer electrolyte fuel cell, and can humidify solid polyelectrolyte membrane, especially the position which can be humidified regularly are equipped with the humidity conditioning layer which consists of absorption-and-desorption-of-moisture material. That is, a humidity conditioning layer counters solid polyelectrolyte membrane, or it has it via an electrode or an electrode, and a charge collector. Specifically, two or more between an anode, between the anode side charge collectors and the anode side charge collector, and the container that stores a fuel cell, or of any places of it are equipped with a humidity conditioning layer between a negative electrode, between the negative-electrode side charge collectors and the negative-electrode side charge collector, and the container that stores a fuel cell. As for a humidity conditioning layer, it is preferred to have between a negative electrode and the negative-electrode side charge collector before long. It may dot with or be uniformly unevenly distributed even if this humidity conditioning layer receives selectively and it has it as opposed to the whole field of solid polyelectrolyte membrane, or so that the front face of the nature film of a solid polymer electric field can be humidified. Especially, it is preferred to have to an electrode or the whole field of a charge collector. This ****** agent may be in the state which left about 10-100 micrometers, adhesion, and the state stuck or estranged selectively to an electrode or the front face of a charge collector. Especially, the state where it stuck is preferred.

[0021]The quantity which absorption-and-desorption-of-moisture material keeps constant the humidity in a polymer electrolyte fuel cell, and can humidify solid polyelectrolyte membrane regularly should just exist. Although it can specifically adjust suitably as the kind and thickness of solid polyelectrolyte membrane in consideration of the kind of absorption-and-desorption-of-moisture material, the size of a polymer electrolyte fuel cell, etc., generally the absorption-and-desorption-of-moisture material abbreviation 1-5g (dryness) is used to about 50-100 micrometers in thickness of solid polyelectrolyte membrane.

[0022]Before absorption-and-desorption-of-moisture material is installed in a polymer electrolyte fuel cell, it is preferred to make it become wet with moisture beforehand. It is for the humidity in a polymer electrolyte fuel cell to prevent falling in the time of power generation for generation of heat by consumption of fuel, reaction fever, etc. As a moisture content included in absorption-and-desorption-of-moisture material at the beginning, it is about ten to 20 g/g preferably about ten to 50 g/g.

[0023]In the polymer electrolyte fuel cell concerning this invention, when liquid fuel is supplied to the negative-electrode side, the humidity by the side of the anode inside a polymer electrolyte fuel cell rises. In connection with it, absorption-and-desorption-of-moisture material absorbs moisture, and the humidity in a polymer electrolyte fuel cell is reduced. By consumption of fuel or evaporation of moisture, since the amount of moisture absorption of absorption-and-desorption-of-moisture material falls when the humidity by the side of a negative electrode falls, absorption-and-desorption-of-moisture material carries out moisture desorption of the moisture within a polymer electrolyte fuel cell, and humidity is raised. Therefore, the absorption-and-desorption-of-moisture material by this invention does not only carry out humidity of the solid polyelectrolyte membrane, and absorption and desorption of moisture is carried out according to the humidity of the cell milieu interne that the humidity in a polymer electrolyte fuel cell should be adjusted, and it has the characteristic which humidifies solid polyelectrolyte membrane as a result.

[0024]It is possible to humidify solid polyelectrolyte membrane regularly by existing in the position in the polymer electrolyte fuel cell which the humidity conditioning layer of this invention keeps constant the humidity in a polymer electrolyte fuel cell, and can humidify solid polyelectrolyte membrane. When it has the structure where solid polyelectrolyte membrane is furthermore sheet-shaped structure, or absorption-and-desorption-of-moisture material was sandwiched by the porous body, it is held between the charge collector and the electrode, and humidification of solid polyelectrolyte membrane is maintained, without a humidity conditioning layer localizing, and it is desirable.

[0025]The absorption-and-desorption-of-moisture material concerning this invention also plays the role of the dispersion layer of a gas or a fluid, when taking porous structure, and it distributes liquid fuel and gaseous fuel inside a polymer electrolyte fuel cell efficiently.

[0026]The polymer electrolyte fuel cell of this invention is usually stored by the container, and in that case, after it pinches a polymer electrolyte fuel cell with the silicon sheet for preventing the liquid leakage from a cell, it may be stored by the case. As a silicon sheet, the high thing of sealing nature and insulation is preferred. The thickness of a sheet is about 0.3-0.5 mm preferably about 0.3-1 mm. As for a case, in order to supply air to the anode side, what the vent is opening is preferred. As a size of a vent, about 3-6-piece [/cm] ^{2} is preferred as abbreviation phi0.5-1mm and a number.

[0027]As fuel supplied to the negative-electrode side, hydrocarbon, such as hydrogen gas, natural gas, propane, butane, and methanol, etc. can be used.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the polymer electrolyte fuel cell which uses a gas or a fluid as fuel. In detail, the humidity in a polymer electrolyte fuel cell is kept constant, and solid polyelectrolyte membrane is related with the polymer electrolyte fuel cell by which it is humidified moderately and in which it deals.

[0002]

[Description of the Prior Art]A fuel cell is a cell which equips with an electrode the both sides of the electrolyte which is an ion conductor, supplies oxidizing gas, such as oxygen and air, to one electrode, supplies liquid fuel, such as gaseous fuel, such as hydrogen and hydrocarbon, or alcohol, to the electrode of another side, makes electrochemical reaction cause, and is made to generate the electrical and electric equipment and water.

[0003]There are various sorts in a fuel cell according to an electrolytic kind, for example, there are an alkaline aqueous solution type, an acid aqueous solution type, a melting carbonate type, a solid oxide type, and a solid polymer type. Among those, the polymer electrolyte fuel cell (PEFC) which uses solid polymer type proton conductivity polymers as an electrolyte is a system which uses high-purity-hydrogen gas as fuel.

[0004]It is possible to make it operate also at a low temperature, and since especially PEFC has high power density also in a low operating-temperature field, its a possibility of being put in practical use by the power generation for cars and the power generation for small-scale residences is high. The direct type methanol fuel cell (DMFC) especially which carries out direct supply of the methanol as fuel, Since a solid polymer electrolyte can be used as an electrolyte, it may be operated below 100 **, it is thought that it fits small size and portability with the fluid since transportation and storage are easy for fuel, and it is seen as a hopeful as the future source of power for cars, and a power supply for mobile electronic equipment.

[0005]The direct type methanol fuel cell (PEM-DMFC) which uses solid polyelectrolyte membrane is a fluorine system poly membrane with a sulfonic group, For example, it has the structure which faced across thin film both sides, such as the Nafion (Nafion) film made from Du Pont, with the porous electrode which the catalyst was made to support, direct supply of the methanol aqueous solution is carried out to a negative electrode, and oxygen or air is supplied to an anode. Here, since an ion conduction substance was water, the solid polyelectrolyte membrane used for a polymer electrolyte fuel cell always needed to be humidified in the fixed state, and the method was examined from the former. Since water is generated by the anode, if it does not drain, water covers the anode side catalyst and it becomes impossible on the other hand, to contact oxygen by the chemical reaction within a solid polymer type cell. Therefore, it is an important technical problem to keep suitable the humidity in a polymer electrolyte fuel cell. At present, in order to humidify solid polyelectrolyte membrane, the method of supplying the humidification fuel which carried out bubbling underwater to a negative electrode is known. Or the law which humidifies a negative electrode uniformly is provided by having a liquid tank and a water tank as shown in JP,9-16180,A, passing the current plate formed with the porous conductive material in the mixture of methanol and water, and supplying a negative electrode.

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[0007]However, between the two above-mentioned examples, by the method of humidifying JP,9-16180,A, the supply of the fuel to a fuel cell must be a flow state, piping and the tank for it are needed and the miniaturization of a fuel cell is difficult for it. On the other hand, in the method of humidifying JP,2000-173633,A, since the humidification to the charge collector by a water retaining layer was not controlled highly, there was a problem of fault humidification that the collecting efficiency falls [the charge collector itself] including water.

[0008]

[Problem(s) to be Solved by the Invention]Therefore, the polymer electrolyte fuel cell which the humidity inside a fuel cell is kept constant, and solid polyelectrolyte membrane is humidified moderately, and does not need the further auxiliary device for gas conditioning, which is miniaturized and in which it deals was called for.

[0009]

[Means for Solving the Problem]According to this invention, a humidity conditioning layer which consists of absorption-and-desorption-of-moisture material in a fuel cell with which a charge collector of a couple was opposite-**(ed) by both sides of solid polyelectrolyte membrane via

an electrode of a couple counters solid polyelectrolyte membrane, Or a polymer electrolyte fuel cell having via an electrode or an electrode, and a charge collector is provided.

[0010]

[Embodiment of the Invention]The polymer electrolyte fuel cell concerning this invention mainly comprises a humidity conditioning layer which consists of the charge collector and absorption-and-desorption-of-moisture material of solid polyelectrolyte membrane, the electrode of a couple, and a couple. Usually, this polymer electrolyte fuel cell may be stored by containers, such as a case and a can.

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[0013]As an electrode, carbon, for example, black lead, expanded graphite, carbon black powder, etc. can be formed as a material. Specifically, carbon paper can be used.

[0014]The electrode may be arbitrarily provided with the catalyst bed. As a catalyst bed, a platinum, platinum alloy, gold, gold alloy, palladium, palladium alloy, and platinum-ruthenium etc. are mentioned. These metal can be used also as which catalyst bed of a negative electrode or an anode. To the catalyst bed of a negative electrode, a platinum-ruthenium is preferred.

[0015]What gave a water-repellent finish porous bases, such as the molding body of carbon paper and carbon, a sintered compact of carbon, a carbon fiber, a sintered metal, a foam metal, and a metal fiber aggregate, is used, and the thing of a charge collector of a carbon fiber is especially preferred.

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mentioned. Especially, silica is preferred. Absorption-and-desorption-of-moisture material has what was prolonged in tunnel form in one dimension, and a preferred thing which has the porous structure which has the shape of fine pores like a honeycomb in three dimensions. It is available with each size and a pole diameter is 50-150A preferably. According to the composition which has this pole diameter, in a high humidity state (not less than 80% of relative humidity), the quantity to humidity which can be absorbed moisture becomes large rather than the absorption-and-desorption-of-moisture material of other pole diameters.

[0017]As a gestalt of absorption-and-desorption-of-moisture material, a meso-porous molecular sieve, a sheet, granulation, particles, etc. are mentioned. Especially, particles are preferred. It is appropriate to contain in one or more stratified sheet-shaped structures where, as for absorption-and-desorption-of-moisture material, both sides were inserted into absorption-and-desorption-of-moisture material by the porous body at the time of particle state. As for the circumference of a porous body, in the case of the structure where a humidity conditioning layer consists of absorption-and-desorption-of-moisture material sandwiched by the porous body, it is preferred to carry out ** with conductive paste. Silver paste, and silver and carbon paste are mentioned, and silver paste of conductive paste is especially preferred.

[0018]As a porous body which sandwiches absorption-and-desorption-of-moisture material, a thing like textile fabrics, a nonwoven fabric, paper making, and extension porous membrane which has a hole is used. The nonwoven fabric which consists of polypropylene, polyethylene, and carbon especially, especially the nonwoven fabric which consists of polypropylene are preferred. about 10-500 A of sizes of the hole of a porous body are about 100-300A preferably -- the number of holes -- about 10^8 - $10^{10}/cm^2$ -- they are about 10^8 / cm^2 preferably. Especially, the nonwoven fabric which has about 10^8 / cm^2 for an about 100-200-A hole is preferred. About 100-500 A of thickness of a porous body is about 200-300A preferably.

[0019]In order to make easy to take out the current from the negative pole electrode side, a metal ion shall be supported to a porous body, or metallic mesh, such as stainless steel and iron, shall be piled up further. Alkali metal ion, such as sodium, potassium, and lithium, can be used for a metal ion, for example.

[0020]The position which keeps constant the humidity in a polymer electrolyte fuel cell, and can humidify solid polyelectrolyte membrane, especially the position which can be humidified regularly are equipped with the humidity conditioning layer which consists of absorption-and-desorption-of-moisture material. That is, a humidity conditioning layer counters solid polyelectrolyte membrane, or it has it via an electrode or an electrode, and a charge collector. Specifically, two or more between an anode, between the anode side charge collectors and the anode side charge collector, and the container that stores a fuel cell, or of any places of it are equipped with a humidity conditioning layer between a negative electrode, between the negative-electrode side charge collectors and the negative-electrode side charge collector, and

the container that stores a fuel cell. As for a humidity conditioning layer, it is preferred to have between a negative electrode and the negative-electrode side charge collector before long. It may dot with or be uniformly unevenly distributed even if this humidity conditioning layer receives selectively and it has it as opposed to the whole field of solid polyelectrolyte membrane, or so that the front face of the nature film of a solid polymer electric field can be humidified. Especially, it is preferred to have to an electrode or the whole field of a charge collector. This ****** agent may be in the state which left about 10-100 micrometers, adhesion, and the state stuck or estranged selectively to an electrode or the front face of a charge collector. Especially, the state where it stuck is preferred.

[0021]The quantity which absorption-and-desorption-of-moisture material keeps constant the humidity in a polymer electrolyte fuel cell, and can humidify solid polyelectrolyte membrane regularly should just exist. Although it can specifically adjust suitably as the kind and thickness of solid polyelectrolyte membrane in consideration of the kind of absorption-and-desorption-of-moisture material, the size of a polymer electrolyte fuel cell, etc., generally the absorption-and-desorption-of-moisture material abbreviation 1-5g (dryness) is used to about 50-100 micrometers in thickness of solid polyelectrolyte membrane.

[0022]Before absorption-and-desorption-of-moisture material is installed in a polymer electrolyte fuel cell, it is preferred to make it become wet with moisture beforehand. It is for the humidity in a polymer electrolyte fuel cell to prevent falling in the time of power generation for generation of heat by consumption of fuel, reaction fever, etc. As a moisture content included in absorption-and-desorption-of-moisture material at the beginning, it is about ten to 20 g/g preferably about ten to 50 g/g.

[0023]In the polymer electrolyte fuel cell concerning this invention, when liquid fuel is supplied to the negative-electrode side, the humidity by the side of the anode inside a polymer electrolyte fuel cell rises. In connection with it, absorption-and-desorption-of-moisture material absorbs moisture, and the humidity in a polymer electrolyte fuel cell is reduced. By consumption of fuel or evaporation of moisture, since the amount of moisture absorption of absorption-and-desorption-of-moisture material falls when the humidity by the side of a negative electrode falls, absorption-and-desorption-of-moisture material carries out moisture desorption of the moisture within a polymer electrolyte fuel cell, and humidity is raised. Therefore, the absorption-and-desorption-of-moisture material by this invention does not only carry out humidity of the solid polyelectrolyte membrane, and absorption and desorption of moisture is carried out according to the humidity of the cell milieu interne that the humidity in a polymer electrolyte fuel cell should be adjusted, and it has the characteristic which humidifies solid polyelectrolyte membrane as a result.

[0024]It is possible to humidify solid polyelectrolyte membrane regularly by existing in the position in the polymer electrolyte fuel cell which the humidity conditioning layer of this

invention keeps constant the humidity in a polymer electrolyte fuel cell, and can humidify solid polyelectrolyte membrane. When it has the structure where solid polyelectrolyte membrane is furthermore sheet-shaped structure, or absorption-and-desorption-of-moisture material was sandwiched by the porous body, it is held between the charge collector and the electrode, and humidification of solid polyelectrolyte membrane is maintained, without a humidity conditioning layer localizing, and it is desirable.

[0025]The absorption-and-desorption-of-moisture material concerning this invention also plays the role of the dispersion layer of a gas or a fluid, when taking porous structure, and it distributes liquid fuel and gaseous fuel inside a polymer electrolyte fuel cell efficiently.

[0026]The polymer electrolyte fuel cell of this invention is usually stored by the container, and in that case, after it pinches a polymer electrolyte fuel cell with the silicon sheet for preventing the liquid leakage from a cell, it may be stored by the case. As a silicon sheet, the high thing of sealing nature and insulation is preferred. The thickness of a sheet is about 0.3-0.5 mm preferably about 0.3-1 mm. As for a case, in order to supply air to the anode side, what the vent is opening is preferred. As a size of a vent, about 3-6-piece [/cm] ^{2} is preferred as abbreviation phi0.5-1mm and a number.

[0027]As fuel supplied to the negative-electrode side, hydrocarbon, such as hydrogen gas, natural gas, propane, butane, and methanol, etc. can be used.

[0028]

[Example]Hereafter, this invention is explained still in detail.

Example 1 drawing 1 shows the example of the polymer electrolyte fuel cell concerning this invention. The humidity conditioning layer 4 is fixed between the negative electrode and the charge collector. In drawing 1, the liquid fuels supply mouth 6 serves as a check valve in order to prevent evaporation of the moisture inside the negative-electrode side cell. The electrolyte membrane which the humidity conditioning layer 4 becomes from the Goa film by Gore-Tex about 50 micrometers thick, It installs in the upper part of five with a catalyst bed (PRIMEA), similarly faces across both sides with the charge collector 3 of the carbon fiber paper (CARBEL) by Gore-Tex about 50 micrometers thick, and, subsequently inserts with 1 mm of frame mold thickness silicon sheet 2. Finally the whole was held with the case 1, insulating coating was carried out or this supporter was fixed with the screw and nut which consist of resin. In addition, the case by the side of a negative electrode is equipped with the vent 8 vacated with the diameter of 3 mm.

Air is supplied from the hole, and it is returned by a positive electrode catalyst layer, and generates electricity.

From the fuel supply port 6, the supplied hydrogen was diffused by the charge collector 3 and the humidity conditioning layer 4, and touched the negative-electrode catalyst bed uniformly.

The example of the humidity conditioning layer 4 by this invention is concretely shown in

drawing 2. The humidity conditioning layer 4 is a sheet shaped which consists of the porous body 9 and the absorption-and-desorption-of-moisture material 11.
The structure is the structure where two-layer absorption-and-desorption-of-moisture material is inserted by the porous body 9 of three layers.
And the circumference is pasted up with the conductive paste 10. This porous body 9 is further provided with the metallic mesh 12.
[0029]The nonwoven fabric of a porous body with a thickness [about 20 micrometers] of 5 cm x 5 cm which specifically consists a hole with a pole diameter of about 10-50 A of polypropylene which has an about 10^{10} hole / cm^2, 1 g of porous silica of a granular gestalt which has a pole diameter of about 10-50 A as absorption-and-desorption-of-moisture material is piled up by turns, It installed so that what is 50 micrometers in thickness into which porous silica was inserted with the nonwoven fabric might become a bilayer, and subsequently the circumference was pasted up with about 0.5 g of conductive paste, and the porous silica bilayer produced the humidity conditioning layer 4 inserted and constituted three layers of nonwoven fabrics, and between them. The above-mentioned humidity conditioning layer 4 is made to become wet with pure water beforehand, and contains the moisture of about 10 g/g.
[0030]A polymer electrolyte fuel cell like drawing 3 like Example 1 was produced except not using a nonwoven fabric as Example 2 and Example 2.
A polymer electrolyte fuel cell like drawing 4 like Example 1 was produced except not fixing a humidity conditioning layer as the reference example 1 reference example 1.
[0031]About the polymer electrolyte fuel cell obtained by the evaluation examples 1 and 2 and the reference example 1 of the polymer electrolyte fuel cell, the power generation state when hydrogen was used as fuel was observed. In the polymer electrolyte fuel cell of Example 1, by generation of heat by consumption of the fuel in a negative-electrode catalyst bed, reaction fever, etc., etc., although the inside of a negative-electrode catalyst bed is dried, The inner humidity of the polymer electrolyte fuel cell was kept constant by the moisture desorption of the humidity conditioning layer 4 made to become wet beforehand, and the steady power generation for 10 hours was observed. As for the cell of Example 2, the fall of about twenty percent of the production of electricity was seen 5 hours after the power generation start.
[0032]The generation action almost suspended the cell of the reference example 1 3 hours afterward. It is thought that it is because, as for this, the cell of the reference example 1 has not equipped the humidity conditioning layer, so solid polyelectrolyte membrane was dried without being humidified and the electrolyte membrane has deteriorated.
[0033]
[Effect of the Invention]In the polymer electrolyte fuel cell concerning this invention, the effect which keeps humidity constant also to the humidity in a high humidity state was seen by using the absorption-and-desorption-of-moisture agent which has porous structure. When an

absorption-and-desorption-of-moisture agent was held by a porous body, the generation efficiency of the polymer electrolyte fuel cell was raised rather than the time of not being held. A conditioning agent also plays the role of a dispersion layer within a polymer electrolyte fuel cell, and distributes the liquid fuel or gaseous fuel of a cell inside a polymer electrolyte fuel cell efficiently.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
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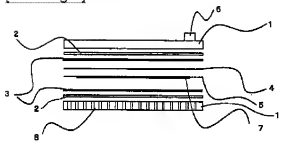
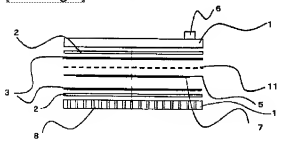
DRAWINGS

[Drawing 1]

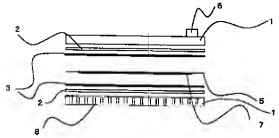


[Drawing 2]

[Drawing 3]



[Drawing 4]



[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The side view of a polymer electrolyte fuel cell (example 1) is shown.
[Drawing 2]The side view of the humidity conditioning layer which constitutes a polymer electrolyte fuel cell is shown.
[Drawing 3]The side view of the polymer electrolyte fuel cell (example 2) which did not equip a porous body but equipped only absorption-and-desorption-of-moisture material is shown.
[Drawing 4]The side view of the polymer electrolyte fuel cell (reference example 1) which does not equip a humidity conditioning layer is shown.
[Description of Notations]
1 Case
2 Silicon sheet
3 Charge collector (carbon fiber paper)
4 Humidity conditioning layer
5 An electrolyte membrane with an electrode catalyst layer
6 Fuel supply port
7 Electrode catalyst layer
8 Vent
9 Porous body
10 Conductive paste
11 Absorption-and-desorption-of-moisture material
12 Metal mesh

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1]A polymer electrolyte fuel cell, wherein a humidity conditioning layer which consists of absorption-and-desorption-of-moisture material counters solid polyelectrolyte membrane or it has it via an electrode or an electrode, and a charge collector in a polymer electrolyte fuel cell with which a charge collector of a couple was opposite-**(ed) by both sides of solid polyelectrolyte membrane via an electrode of a couple.
[Claim 2]The polymer electrolyte fuel cell according to claim 1 whose absorption-and-desorption-of-moisture material is one or more things chosen from a silicate, an aluminate, zirconia, manganese oxide, a hexacyano iron-oxide salt, an phosphate, silica gel, and zeolite.
[Claim 3]The polymer electrolyte fuel cell according to claim 1, wherein absorption-and-desorption-of-moisture material is particle structure.
[Claim 4]A polymer electrolyte fuel cell of any one statement of claim 1-3, wherein a humidity conditioning layer consists of absorption-and-desorption-of-moisture material held by a porous body.
[Claim 5]The polymer electrolyte fuel cell according to claim 4, wherein a porous body is what supports a metal ion.
[Claim 6]The polymer electrolyte fuel cell according to claim 4, wherein a porous body is further provided with a mesh which consists of metal.
[Claim 7]A polymer electrolyte fuel cell of any one statement of claim 1-6, wherein a humidity conditioning layer is located between a negative electrode and a charge collector.
[Claim 8]The polymer electrolyte fuel cell according to claim 1, wherein a polymer electrolyte fuel cell of claim 1 is stored by container which offered a fuel supply port and equips a fuel supply port of this container with a check valve.

[Translation done.]